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USER MANUAL
PDCI-20V PROGRAMMABLE CDI IGNITION AND PV CONTROLLER

Limit values:

- minimum revs	200 RPM
- maximum revs	20000 RPM
- minimum supply voltage	7 Volts
- maximum supply voltage	18 Volts
- stand-by current draw	< 0.09 Amp
- current draw at 1300 RPM	< 0.3 Amp
- current draw at 12000 RPM	< 1.7 Amp
- maximum continuous current for shift light and power jet output	1 Amp
- peak current for shift light and power jet output	5 Amp
- constant spark energy from idle to 13000 RPM	>35mJ

Circuit is protected against reverse supply voltage (wrong connection).

Features:
- fast power-up (also starts only with condenser)
- full power starting spark energy already at 7Volts power supply
- two isolated input (pickup)
- two independent ignition coil outputs
- individual advance/retard of each output
- store and load function for two ignition maps
- external switch for changing ignition map while riding
- TPS input (Throttle Position Sensor)
- shift light output
- 2 power jet outputs
- duty cycle solenoid output (for regulating A/F ratio on some carburettors)
- quick shift (shift kill)
- soft rev limit (three stage rev limit)
- reduced spark at high revs with closed throttle (TCT mode)
- tachometer output
- easy and fast programming on the field, via hand held programmer
- programming while machine running - you can immediately see effects
- each curve can be set in 4 to 12 curve points
- 3D interpolated ignition map, if TPS selected
- signal delay compensation
- instant monitoring of rev's and angle, via LCD(hand held programmer)
- programmable power valve actuation

- store and load function for 5 PV curves
- external switch for changing PV curve while riding
- programmable PV deviation
- programmable max close and max open positions
- self PV test on power-up
- PV error detecting (position sensor failure, servo motor failure)
- fast processing for high accuracy - delays from 1us
- timing calculation for every 1 RPM change (1000, 1002, .. , 9805, 9806, ...)

Very important!
Resistor spark plugs must be used, because they produce less electromagnetic disturbances.

Danger of electric shock!
Avoid connecting PDCI to 12V power supply, before connecting it to ignition coil. High voltage is generated and touching free wires can cause electric shock, or damage the unit.

1. HOW TO ENTER MENU

PDCI must be connected to power supply. Connect **programmer** to **PDCI** and wait few seconds for activation of **programmer** and then press [enter]. With pressing [+] or [-] you can move through menu and with pressing [enter] you can choose.
You can exit menu with choosing ***Exit.***

2. MENU ORGANISATION

Set Ign.	- set ignition parameters submenu
Set PV	- set PV parameters submenu
Exit	

2.1. SET IGNITION PARAMETERS SUBMENU

Load Ign. Map	- load (select) ignition map (from #1 to #2)
Save Ign. Map	- save new ignition map (from #1 to #2)
Set Ignition Map	- ignition map parameters submenu
Advance	- advance/retard whole ignition map on both ignition coil outputs
Advance 1	- advance/retard ignition coil output 1
Advance 2	- advance/retard ignition coil output 2
Gear Shift Light	- shift light
Quick Shift	- quick shift settings
Rev Limit	- rev limit
Static Angle	- static angle (stator position)
Compensation	- signal delay compensation (from pickup to spark plug)
Power Jet 1	- power jet 1
Solenoid Output	- solenoid output settings (power jet 2, or duty solenoid)
TPS	- enable, or disable TPS
TPS close [0%]	- calibrating TPS close position
TPS open [100%]	- calibrating TPS open position

TCT mode - reduced spark at high revs with closed throttle
Ign. Map SW - activating/deactivating external switch for selecting ignition map
Pulses Per Rev - number pulses per revolution from pickup
Exit

2.2. SET PV PARAMETERS SUBMENU

Load PV Curve - load (select) PV curve (from #1 to #5)
Save PV Curve - save new PV curve (from #1 to #5)
Set PV Curve - PV curve parameters submenu
Deviation +- - deviation of PV position
Close Position - max close PV position
Open Position - max open PV position
PV Test - PV position test
Power-up Test - enable, or disable test cycle at power-up
PV Curve SW - activating/deactivating external switch for selecting PV curve
Exit

3. LOAD IGN. MAP

Enter ***Set Ign.*** menu and move to ***Load Ign. Map*** with pressing [+] or [-] and then press [enter] .
Now you can select number of saved ignition map, with pressing [+] or [-] and then press [enter] .

4. SAVE IGN. MAP

Enter ***Set Ign.*** menu and move to ***Save Ign. Map*** with pressing [+] or [-] and then press [enter] .
Now you can select number to which you want to save your ignition map, with pressing [+] or [-] and then press [enter] .

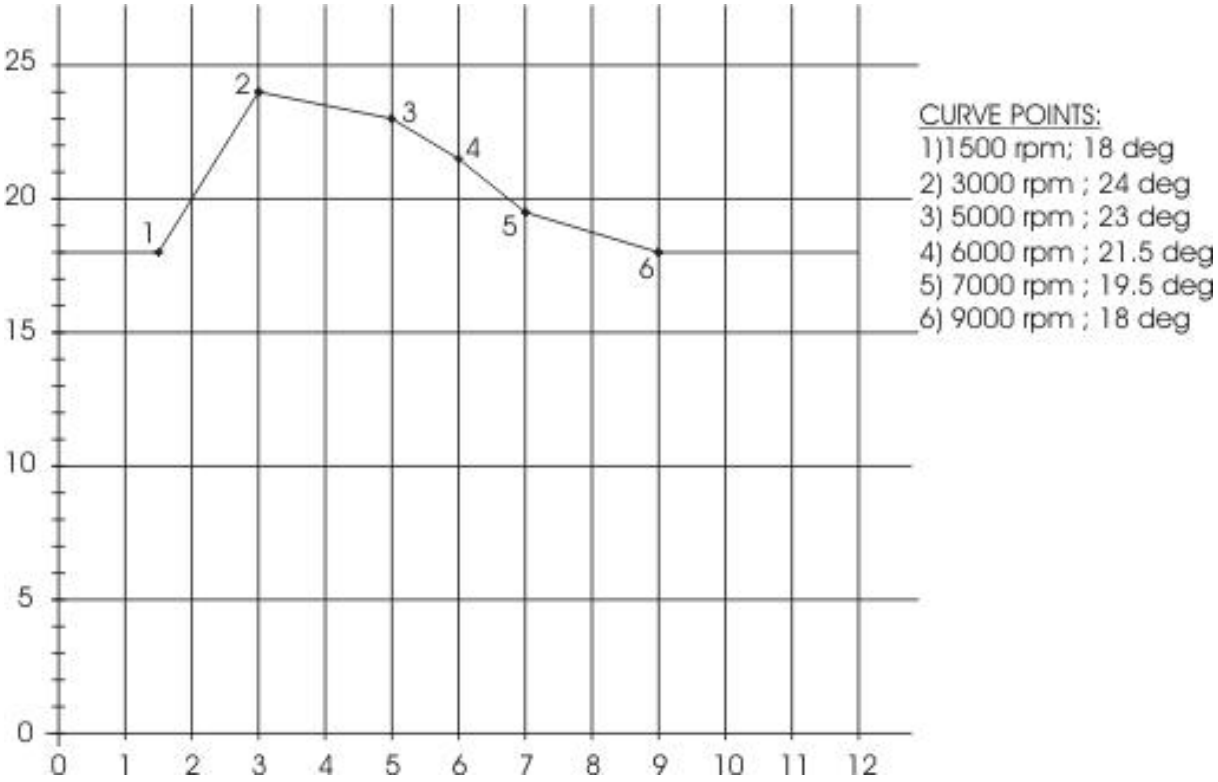
5. SET IGNITION MAP *(if TPS disabled)*

Enter ***Set Ign.*** menu and move to ***Set Ignition Map*** with pressing [+] or [-] and then press [enter].
...you entered submenu for setting ignition map.

Submenu organisation:
Nr. of Points - number of ignition curve points (from 4 to 12)
1) - first ignition curve point
2) - second ignition curve point
... ...
... ...
Exit - exit submenu

Important!
To avoid wrong processing, don't make unreasonable curve course.
Every time you make any changes to ignition curve, it is automatically saved to number #0.
Later you can save it to any other number #1 or #2.

Curve Example with six curve points:



5.1. SET IGNITION MAP *(if TPS enabled)*

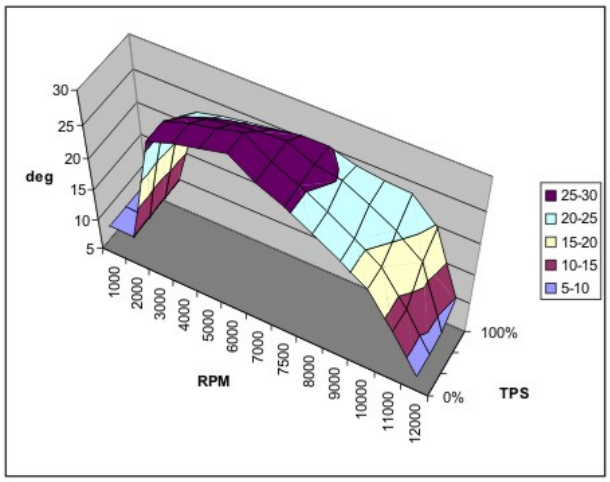
Three ignition curves must be programmed for different TPS positions. **PDCI** does not only switch between ignition curves, but also interpolate 3D map for all TPS positions above 33%.

Enter ***Set Ign.*** menu and move to ***Set Ignition Map*** with pressing [+] or [-] and then press [enter].
...you entered submenu for selecting ignition curve.

Submenu organisation:
Nr. of Points - number of ignition curve points (from 4 to 10)
Curve 0-33% - ignition curve from 0 to 33% TPS
Curve 66% - ignition curve for 66% TPS
Curve 100% - ignition curve for 100% TPS
Exit - exit submenu

Important!
To avoid wrong processing, don't make unreasonable curve course.
Every time you make any changes to ignition curve, it is automatically saved to number #0.
Later you can save it to any other number #1 or #2.

Ignition Map Example:



5.2. Change NUMBER OF IGNITION CURVE POINTS

Move to ***Nr. of Points*** with pressing [+] or [-] and then press [enter] .
Now you can select number of ignition points, with pressing [+] or [-] and then press [enter] .

5.3. Change PARAMETERS OF IGNITION CURVE POINT

Move to point you want to change, with pressing [+] or [-] and then press [enter] .
Now you can change rev point with pressing [+] or [-] (in 100 rpm steps) and then press [enter] .
Now you can change advance angle with pressing [+] or [-] (in 0.1deg steps) and then press [enter] .

6. ADVANCE

With this setting is possible to advance, or retard whole ignition map on both ignition coil outputs. When setting is positive, then ignition map is advanced and when setting is negative, than ignition map is retarded. Ignition map is unchanged, with setting ***0.0deg***.

Enter menu and move to ***Advance***, with pressing [+] or [-] and then press [enter] .
Now you can set advance with pressing [+] or [-] (in 0.1deg steps) and then press [enter] .

7. ADVANCE 1

With this setting is possible to advance, or retard ignition map only on ignition coil output 1. When setting is positive, then ignition map is advanced and when setting is negative than, ignition map is retarded. Ignition map is unchanged, with setting ***0.0deg***.

Enter menu and move to ***Advance***, with pressing [+] or [-] and then press [enter] .
Now you can set advance with pressing [+] or [-] (in 0.1deg steps) and then press [enter] .

8. ADVANCE 2

With this setting is possible to advance, or retard ignition map only on ignition coil output 2. When setting is positive then, ignition map is advanced and when setting is negative than, ignition map is retarded. Ignition map is unchanged, with setting ***0.0deg***.

Enter menu and move to ***Advance***, with pressing [+] or [-] and then press [enter] .
Now you can set advance with pressing [+] or [-] (in 0.1deg steps) and then press [enter] .

9. GEAR SHIFT LIGHT

Enter ***Set Ign.*** menu and move to ***Gear Shift Light*** with pressing [+] or [-] and then press [enter] .
Now you can change rev point with pressing [+] or [-] (in 100 rpm steps) and then press [enter] .

10. QUICK SHIFT

Enter ***Set Ign.*** menu and move to ***Quick Shift*** with pressing [+] or [-] and then press [enter] .
...you entered submenu for quick shift settings.

Submenu organisation:

Shift Kill Time	- basic kill time
Smart Shift	- activating/deactivating automatic kill time for different revs
Exit	- exit submenu

10.1. SHIFT KILL TIME

Enter ***Quich Shift*** menu and move to ***Shift Kill Time*** with pressing [+] or [-] and then press [enter].
Now you can change kill time with pressing [+] or [-] (in 10 ms steps) and then press [enter] .

10.2. SMART SHIFT

Smart shift function automatically adjusts kill time for different revs. Shift kill time must be always set, as basic kill time.
Enter ***Quich Shift*** menu and move to ***Smart Shift*** with pressing [+] or [-] and then press [enter].
Now you can enable, or disable function with pressing [+] or [-] and then press [enter] .

11. REV LIMIT

Enter ***Set Ign.*** menu and move to ***Rev Limit*** with pressing [+] or [-] and then press [enter] .
Now you can change rev limit with pressing [+] or [-] (in 100 rpm steps) and then press [enter] .

12. STATIC ANGLE

Enter ***Set Ign.*** menu and move to ***Static Angle*** with pressing [+] or [-] and then press [enter] .
Now you can set static angle with pressing [+] or [-] (in 0.1deg steps) and then press [enter] .

More information's about static angle you can find in section 31.

13. COMPENSATION

It is compensation of signal delay from pickup to spark plugs. You can check this delay with stroboscope lamp. Without this compensation, ignition advance angle decreasing with rising revs.
This compensation helps that advance angles in ignition curve are real (more accurate).

How to check, if compensation is correct:
First you must set flat ignition curve. Then measure with stroboscope lamp, if mark at flywheel moving when changing revs. If mark moving then you must change compensation delay.

Change Compensation:
Enter menu and move to ***Compensation*** with pressing [+] or [-] and then press [enter] .
Now you can change compensation delay with pressing [+] or [-] and then press [enter] .

14. POWER JET 1

Enter ***Set Ign.*** menu and move to ***Power Jet 1*** with pressing [+] or [-] and then press [enter] .
...you entered submenu for setting ***Power Jet 1*** parameters.

Submenu organisation:

Power Jet 1 ON RPM	- revs for activating power jet 1
Power Jet 1 OFF RPM	- revs for deactivating power jet 1
Power Jet 1 ON TPS *(if TPS enabled)*	- throttle position for activating power jet 1
Power Jet 1 OFF TPS *(if TPS enabled)*	- throttle position for deactivating power jet 1
Exit	- exit submenu

Example:
Power jet 1 ON (RPM) = 8000rpm
Power jet 1 OFF (RPM) = 10000rpm
Power jet 1 ON (TPS) = 70%TPS
power jet 1 OFF (TPS) = 90%TPS

Power jet is switched on when revs are between 8000-10000rpm and throttle position is between 70-90%, otherwise power jet is switched off.

14.1. POWER JET 1 ON RPM

Enter ***Set Ign.*** menu and move to ***Power Jet 1 ON RPM*** with pressing [+] or [-] and then press [enter] .
Now you can change ***Power Jet 1 ON RPM*** with pressing [+] or [-] (in 100 rpm steps) and then press [enter] .

14.2. POWER JET 1 OFF RPM

Enter ***Set Ign.*** menu and move to ***Power Jet 1 OFF RPM*** with pressing [+] or [-] and then press [enter] .
Now you can change ***Power Jet 1 OFF RPM*** with pressing [+] or [-] (in 100 rpm steps) and then press [enter] .

14.3. POWER JET 1 ON TPS *(if TPS enabled)*

Enter ***Set Ign.*** menu and move to ***Power Jet 1 ON TPS*** with pressing [+] or [-] and then press [enter] .
Now you can change TPS position with pressing [+] or [-] (in 1%TPS steps) and then press [enter] .

14.4. POWER JET 1 OFF TPS *(if TPS enabled)*

Enter ***Set Ign.*** menu and move to ***Power Jet 1 OFF TPS*** with pressing [+] or [-] and then press [enter] .
Now you can change TPS position with pressing [+] or [-] (in 1%TPS steps) and then press [enter] .

15. SOLENOID OUTPUT

Enter ***Set Ign.*** menu and move to ***Solenoid Output*** with pressing [+] or [-] and then press [enter] .
...you entered submenu for setting ***Solenoid Output*** parameters.

Submenu organisation:

Output type	- select output type (Power Jet 2, or Duty Solenoid)
Power Jet 2 *(if selected)*	- set Power Jet 2 parameters
Duty Solenoid *(if selected)*	- set Duty Solenoid parameters
Exit	- exit submenu

15.1. OUTPUT TYPE

Solenoid output function can be configured as Power Jet 2, or Duty Solenoid. Duty solenoid is used for adjusting A/F ratio on some carburettors.

Enter ***Solenoid Output.*** menu and move to ***Output type*** with pressing [+] or [-] and then press [enter] .
Now you can change solenoid ***Output type*** with pressing [+] or [-] and then press [enter] .

15.2. POWER JET 2 *(if selected in Output Type menu)*

Same settings as ***Power Jet 1***...look at section 14.

15.3. DUTY SOLENOID *(if selected in Output Type menu)*

Three duty cycle curves for different throttle positions can be programmed. Each curve can be programmed in 8 rev points.

Enter ***Solenoid Output*** menu and move to ***Duty Solenoid*** with pressing [+] or [-] and then press [enter] .
...you enterd submenu for setting ***Duty Solenoid*** parameters.

Submenu organisation:

Curve 0-33%	- duty cycle curve from 0 to 33% TPS
Curve 34-66%	- duty cycle curve from 34 to 66% TPS
Curve 67-100%	- duty cycle curve from 67 to 100% TPS
Exit	- exit submenu

15.3.1 Set PARAMETERS FOR DUTY SOLENOID CURVE POINT

Move to point you want to change, with pressing + or - and then press enter .
Now you can change rev point with pressing + or - (in 100 rpm steps) and then press enter .
Now you can change duty cycle with pressing + or - (in 1% steps) and then press enter .

16. TPS

Enabling, or disabling Throttle Position Sensor.

Enter ***Set Ign.*** menu and move to ***TPS*** with pressing + or - and then press enter .
Now you can enable or disable TPS with pressing + or - and then press enter .

17. Set TPS close [0%] *(if TPS enabled)*

For correct operation, TPS close position must be calibrated!
Enter ***Set Ign.*** menu and move to ***TPS close [0%]*** with pressing + or - and then press enter.
Leave throttle at close position and confirm calibrating with pressing enter , or exit calibration with pressing - . Displayed number should be between 0 and 500.

18. Set TPS open [100%] *(if TPS enabled)*

For correct operation, TPS open position must be calibrated!
Enter ***Set Ign.*** menu and move to ***TPS open [100%]*** with pressing + or - and then press enter.
Move throttle to maximum open position and confirm calibrating with pressing enter , or exit calibration with pressing - . Displayed number should be between 500 and 1010.

19. TCT mode

Throttle Close spark Termination mode, reduces number of sparks (spark is active every third revolution) above 8000rpm, when throttle is closed. TCT mode ensure better engine cooling.

Enter ***Set Ign.*** menu and move to ***TCT mode*** with pressing + or - and then press enter .
Now you can enable or disable ***TCT mode*** with pressing + or - and then press enter .

20. IGN. MAP SW

Enabling, or disabling ignition map switch, for changing ignition maps while riding.

Enter ***Set Ign.*** menu and move to ***Ign. Map SW*** with pressing + or - and then press enter .
Now you can enable or disable external switch with pressing + or - and then press enter .

21. PULSES PER REV

It is number of pulses per rev from pickup coil and is important for correct rev reading. Setting is 2 for all twins with wasted spark ignition system.
Enter ***Set Ign.*** menu and move to ***Pulses Per Rev*** with pressing [+] or [-] and then press [enter].
Now you can change nr. of pulses per rev with pressing [+] or [-] and then press [enter] .

22. LOAD PV CURVE

Enter ***Set PV*** menu and move to ***Load PV Curve*** with pressing [+] or [-] and then press [enter].
Now you can select number of PV curve with pressing [+] or [-] and then press [enter] .

23. SAVE PV CURVE

Enter ***Set PV*** menu and move to ***Save PV Curve*** with pressing [+] or [-] and then press [enter].
Now you can select number to save your PV curve, with pressing [+] or [-] and then press [enter].

24. Set PV Curve

Enter ***Set PV*** menu and move to ***Set PV Curve*** with pressing [+] or [-] and then press [enter] .
...you entered submenu for setting PV curve.

Submenu organisation:

Nr. of Points	- number of PV curve points (from 2 to 8)
1)	- first valve position point
2)	- second valve position point
...	...
...	...
Exit	- exit submenu

Important!
To avoid wrong processing, don't make unreasonable curve course.
Every time you make any changes to PV curve, it is automatically saved to number #0. Later you can save it to any other number from #1 to #5.

24.1. Change Number of Curve Points

Move to ***Nr. of Points*** with pressing [+] or [-] and then press [enter] .
Now you can select number of curve points, with pressing [+] or [-] and then press [enter] .

24.2. Change Parameters of PV Curve Points

Move to point you want to change, with pressing [+] or [-] and then press [enter] .
Now you can change rev point with pressing [+] or [-] (in 100 rpm steps) and then press [enter] .
Now you can change PV position from 0% to 100%, with pressing [+] or [-] (in 1% steps) and then press [enter] .

25. Set Deviation

Enter ***Set PV*** menu and move to ***Deviation*** with pressing [+] or [-] and then press [enter] .
Now you can change deviation from 2% to 20% with pressing [+] or [-] (in 1% steps) and then press [enter] .
Deviation means how accurate valve is moved to calculated position. If deviation is too low then servo motor won't be stabile – it will always search for calculated position in small movements. Default setting is +-5% and should meet in most cases.

26. CLOSE POSITION

Max close position must be calibrated after installation. Max close position is when curve is set to 0%. Close position can be moved to any desired position.

Enter ***Set PV*** menu and move to ***Close Position*** with pressing [+] or [-] and then press [enter] .
Now you can set close position with pressing [+] or [-] and then press [enter] .

27. OPEN POSITION

Max open position must be calibrated after installation. Max open position is when curve is set to 100%. Open position can be moved to any desired position.

Enter ***Set PV*** menu and move to ***Open Position*** with pressing [+] or [-] and then press [enter] .
Now you can set open position with pressing [+] or [-] and then press [enter] .
Max open position is when curve is set to 100%. This open position can be moved to any desired position.

28. PV Test

PV test can be used for testing or measuring valve position. Valve can be moved to any position from 0% to 100%, without engine running.

Enter ***Set PV*** menu and move to ***PV Test*** with pressing [+] or [-] and then press [enter] .
Now you can set valve position with pressing [+] or [-] and then press [enter] .

29. POWER-UP Test

Enabling or disabling test cycle of PV servo at power-up.

Enter ***Set PV*** menu and move to ***Power-up Test*** with pressing [+] or [-] and then press [enter] .
Now you can enable or disable power-up test with pressing [+] or [-] and then press [enter] .

30. PV CURVE SW

Enabling, or disabling PV curve switch for changing PV curves while riding.

Enter ***Set PV*** menu and move to ***PV Curve SW*** with pressing [+] or [-] and then press [enter] .
Now you can enable, or disable ***PV Curve*** switch with pressing [+] or [-] and then press [enter] .

31. MECHANICAL SETTINGS (Static Angle)

Static Angle is ignition advance angle, set with stator (generator).
Measure this angle with dial gauge. This measured **Static Angle** is your maximum advance angle you can set with **PDCI**.

Calculating mm to deg or vice versa:

α = ignition advance in degrees
T = ignition advance in mm
R = engine stroke divided by 2 in mm
L = conrod length in mm

$$P = R + L - T$$

$$\alpha = \cos^{-1}\left(\frac{P^2 + R^2 - L^2}{2 \cdot P \cdot R}\right)$$

$$T = L + R \cdot (1 - \cos\alpha) - \sqrt{L^2 - (R \cdot \sin\alpha)^2}$$

32. MONITORING

Connect **programmer** to **PDCI** and wait few seconds for activation of **programmer.** Fist information displayed on the **programmer** is software version.

With **programmer** you can watch revs, calculated advance ignition angle, TPS position...depends on setting in the menu.

Information!
You can connect or disconnect **PDCI** unit from **programmer** any time you want, without any harm. It is not important, if motor running or not and if power supply is connected or not.

Important!
Do not use too much force when connecting or disconnecting **programmer** unit!

33. ERROR REPORTS

PVerr 1 – position sensor error or servo motor disconnected
PVerr 2 – servo motor error (short connection)